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CSF epidemiosurveillance in French wild boars

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Introduction

Each year, around 220,000 wild boars are shot in France. In addition, almost 1500 herds produce about 65,000 captive boars per year. Wild boars are found everywhere in the country but the highest densities are encountered in the east, the centre and the area bordering the Mediterranean sea. Contacts between wild boars and domestic pigs kept in outdoor farms occur occasionally. However, both species are equally susceptible to many virus infections like Aujeszky's disease, porcine reproductive and respiratory syndrome and of course the classical swine fever (CSF). In 1991, the French Ministry of Agriculture decided to settle a national epidemiosurveillance programme on wild boar populations. This presentation reports the results of this programme over a period of 6 years (1991-97).

Material and methods

Sampling and epidemiological data

Blood samples were collected in wild boars by trained hunters. Blood samples from captive wild boars were collected by veterinarians or stock-breeders.

The blood were centrifuged and the sera collected in the Regional Veterinary Diagnostic Laboratories. Then, the sera were sent to CNEVA for subsequent analysis.

All sera were accompanied by a questionnaire giving epidemiological informations related to the geographical origin of sampling, the sex and age of animals sampled.

Serum analysis

All sera were tested by a blocking ELISA developed in CNEVA Ploufragan. It is based on the competition between the serum antibodies and a rabbit CSFV antiserum. The ELISA antigen was prepared from cell cultures infected with the Alfort strain.

When positive reactions were obtained, a second ELISA test using a Border Disease antigen (Aveyron strain) was carried out in parallel with the CSF ELISA in order to determine whether antibodies were specific for CSF virus or ruminant pestiviruses. If results were still inconclusive, a differential neutralisation test using both the Alfort and Aveyron strains was carried out.

Processing of data

All epidemiological data and ELISA results were computerised on a PC file under the paradox software. From these informations, geographic distributions of results were

established on maps by the software « Décisionnel Cartes et Bases » (ADDE, Levallois-Perret, France).

Results and discussion

Amount and distribution of samples

In table 1, are reported the numbers of French territorial sub-divisions (départements) which were concerned by the successive surveys from 1991 to 1997. It also shows the number of herds or beats and the number of sera collected. After the first annual sampling campaign, the number of « départements » increased then stabilised around 30-40 which is almost half of the total number of « départements » (= 95). The numbers of sera collected in wild boars increased also and then remained stable at around 1000 sera. From 1994, the number of sera collected in captive boars decreased from 1728 to 614 and then stabilised at about 500 sera. This decrease was due to the proposition of the Ministry of Agriculture to include captive boars in the national surveillance programme on domestic pig diseases in 1994. Then, in some « départements », the local veterinary authority decided to send the sera of wild boars to the Regional Veterinary Diagnostic Laboratories for testing as were tested the sera of domestic pigs. These Regional Laboratories screen about 100,000 pig sera per year for CSFV antibodies. The sera of wild boars tested by these laboratories from 1994 escaped the national serological inquiry carried out by the CNEVA. However, if any positive or doubtful sera had been obtained in these Regional Laboratories, the CNEVA as the CSF National Reference Laboratory would have to confirm the specificity of the results. In other words, all wild boars tested by the Regional Laboratories (presumably 500 per year) were found negative for CSF antibodies.

Blood samples originating from other « départements » were still sent to the CNEVA. They were tested and integrated into the inquiry at an average of 500 sera per year from 1994 to 1997.

The figure 2 illustrates the geographical distribution of serum collection to be compared with the natural distribution of wild boar population (figure 1). We observed that the « départements » which provided a steady contribution to the sampling were generally those concerned with an important wild boar population.

ELISA results

Out of 10942 sera tested over the whole period, 314 (2.9%) were found positive in the ELISA test (table 2). Out of these 314 positive sera, 235 (75%) were confirmed to be positive for ruminant pestivirus antibodies. The distribution of these positive sera did not show any regional disparity (figure 3).

Among the 79 sera positive for CSF antibodies, 2 were collected from captive boars. One was sampled in 1992 shortly after the onset of the infection in the east of France. This animal turned out to be a young boar born from a seropositive dam which was shot in the CSF infected zone.

No epidemiological explanation could be found for the other CSF-positive boar. Additional samples on animals present in the herd were all negative for CSF antibodies. No clinical signs were observed in this herd, therefore, it was concluded that the initial result was not specific.

Out of 77 CSF-positive wild boars, 66 (86%) corresponded to animals sampled in the infected zone of the east of France during the surveys 1992-93 and 1993-94. In the two following surveys (1994-95 and 1995-96), the positive sera came from wild boars killed in Corsica (10 positive sera out of 492, prevalence = 0.02%). In this French island, there was no abnormal mortality in the wild boar population. Since these positive boars were old animals, we assumed that they were old vaccinated captive boars released in the field. In the last survey (1996-97), the positive boar was sampled in the north of France where CSF disease was not reported. The amount of serum available was not sufficient to perform a neutralisation test for confirmation of CSF positivity. Since no abnormal mortality was seen in wild boars from this area, we believe that this positive result was not in relation with CSF infection. However, additional samplings will be carried out to control the area and to confirm the health status of the wild boar population.

Conclusion

This study gives serological results on blood samples collected in wild boars over a period of 6 consecutive years. Despite the large amount of sera tested (about 11,000), this epidemiological inquiry has two limits. The first one is the low sampling representativity compared to the importance of the population. Less than 0.4 % of the whole population and only 0.7 % of boars killed each year were actually tested. A second bias was due to the sampling procedure which was not systematic and homogeneous between the « départements », but rather based on individual contributions (volunteers). Nevertheless, the distribution of the samples generally reflected the distribution of wild boar population.

Despite these limits, this continuous inquiry over a period of six years provide two epidemiological informations. Firstly, excepted in the east of France, the negative results for CSF antibodies obtained in the successive surveys, confirm our feeling that the French wild boar population is free of CSF infection. Secondly, this inquiry shows that the CSF epidemic that emerged in 1992 in the east of France was not of endogenous origin but was probably due to the introduction of the virus from outside the country.

The detection of ruminant pestivirus antibodies in wild boars is not negligible (around 3 %). This prevalence could increase with the density of wild boars and wild ruminants, although it is not possible to determine whether the infection of wild boars with ruminant pestiviruses occurs through contacts with wild ruminants.

Our serological inquiry shows that wild boars are infected by CSFV (in the east of France) and also by ruminant pestivirus. They can also be infected by Aujeszky's disease virus and porcine reproductive and respiratory syndrome virus (results published by Oslage and col.). Therefore wild boars constitute a reservoir for many different virus infections of domestic pigs. This largely justifies the importance of a numeric control of the wild boar population, because high densities increase the risk for virus transmission between boars and the possibilities of contacts between wild boars and domestic pigs.

Period	Number of « départements »	Number of herds or beats	Number of sera
1991-92	30 / 20 *	160 / 135 *	667 / 418 *
1992-93	52 / 47	250 / 651	1132 / 1214
1993-94	50 / 51	303 / 323	1728 / 974
1994-95	19 / 35	146 / 676	614 / 1377
1995-96	26 / 38	103 / 439	414 / 953
1996-97	23 / 30	143 / 351	563 / 888
Total			5118 / 5824

Table 1: Number of « départements », herds or beats concerned by the six consecutive surveys carried out from 1991 to 1997. For each survey the number of sera tested is indicated: the first number corresponds to captive boars sampled in herds and the second one corresponds to wild boars killed by hunters (*).

Period	Number of sera positive for CSF antibodies	Number of sera positive for ruminant pestivirus antibodies
1991-92	0 / 0 *	13 / 7 *
1992-93	1 / 59	22 / 17
1993-94	0 / 7	60 / 19
1994-95	1 / 9	27 / 39
1995-96	0 / 1	2 / 9
1996-97	0 / 1	10 / 10
	2 / 77	134 / 101
Total	79	235
314		

Table 2: Results of CSF and ruminant pestivirus antibody detections for six consecutive surveys. The first number corresponds to captive boars sampled in herds and the second one corresponds to wild boars killed by hunters (*).

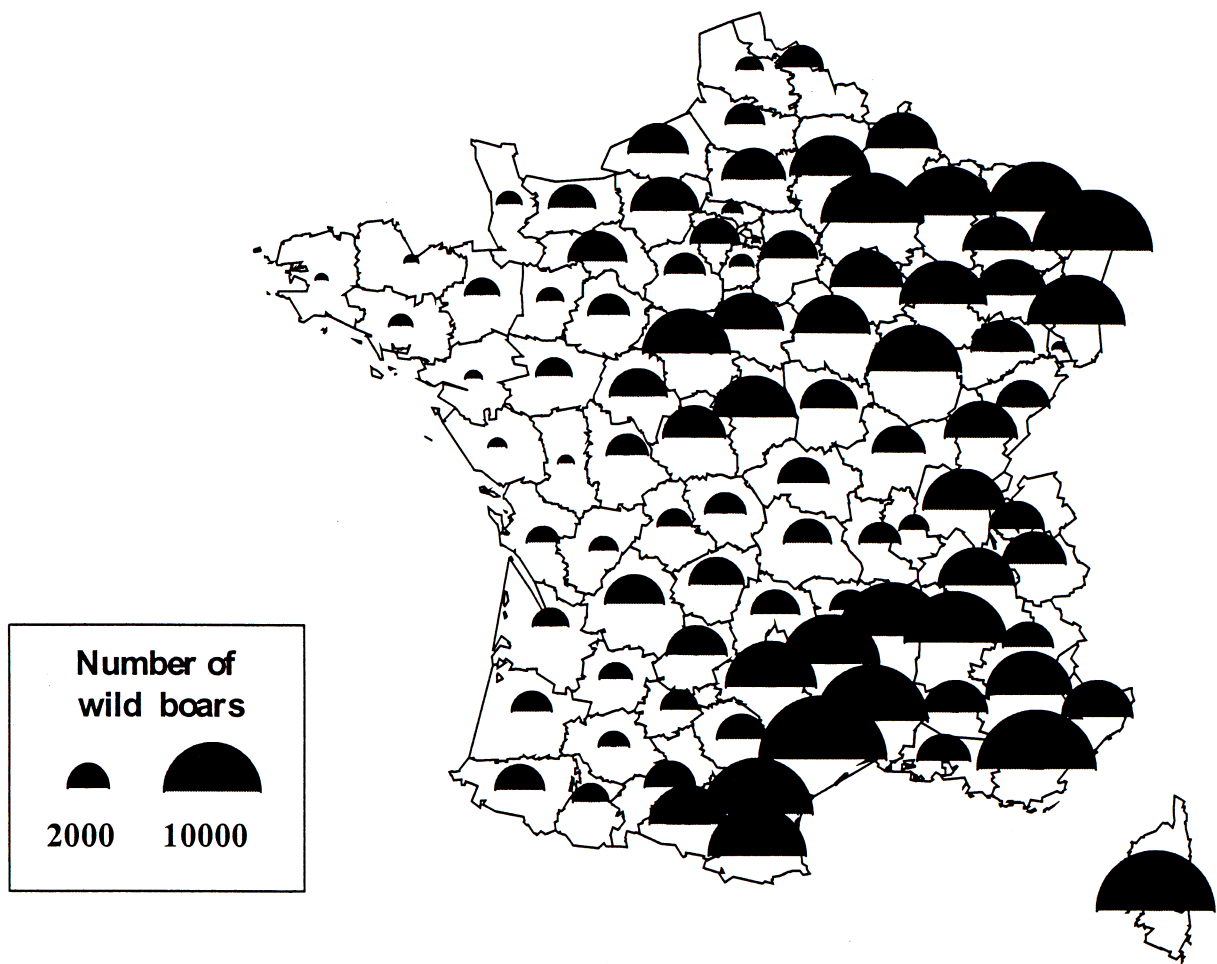


Figure 1: Distribution of wild boars in France

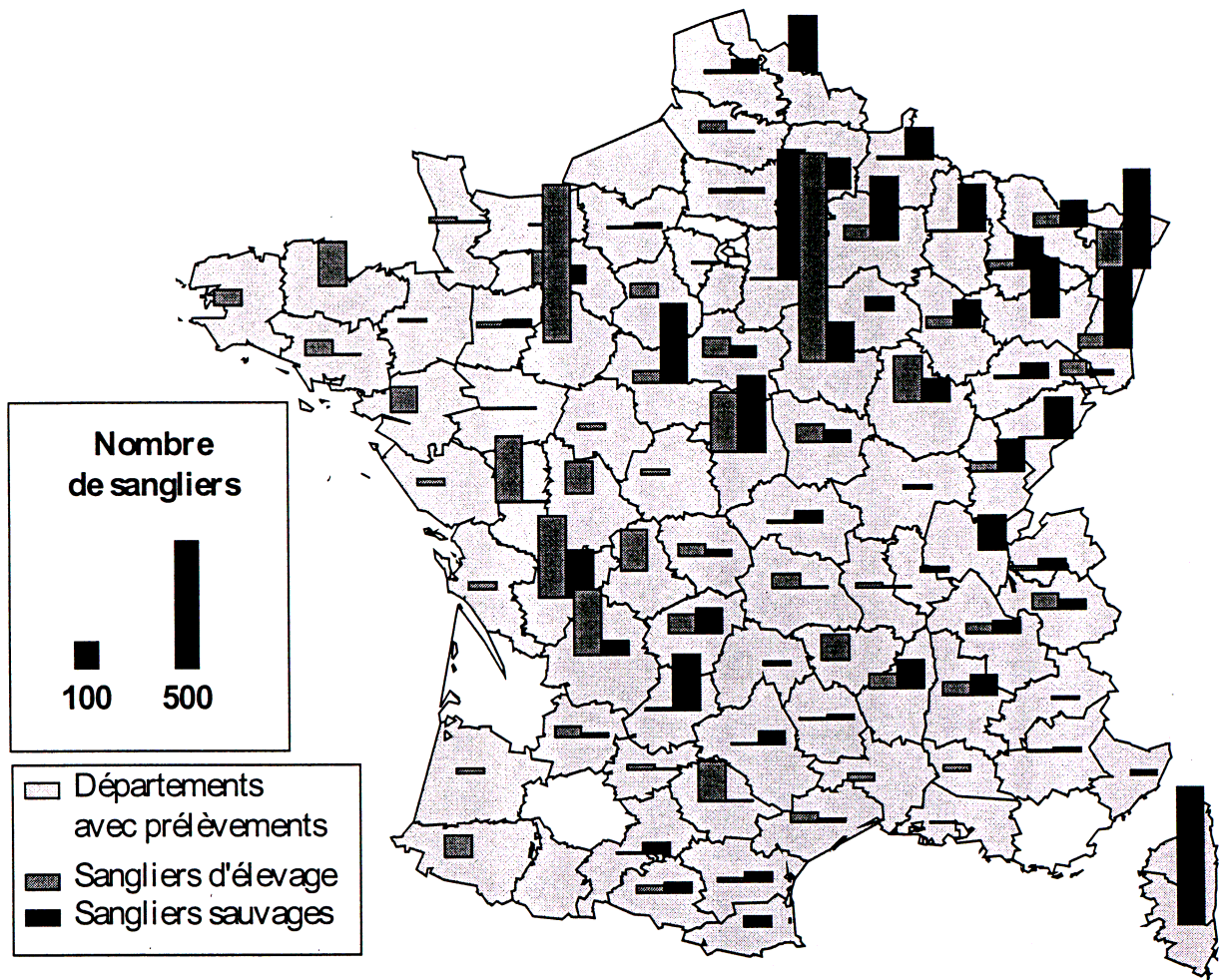


Figure 2: Distribution of wild boars sampled in France during the 6-year serological inquiry. The « départements » where samples were collected are in light grey. Bars represent the number of samples for captive boars (light grey) and wild boars (dark grey).

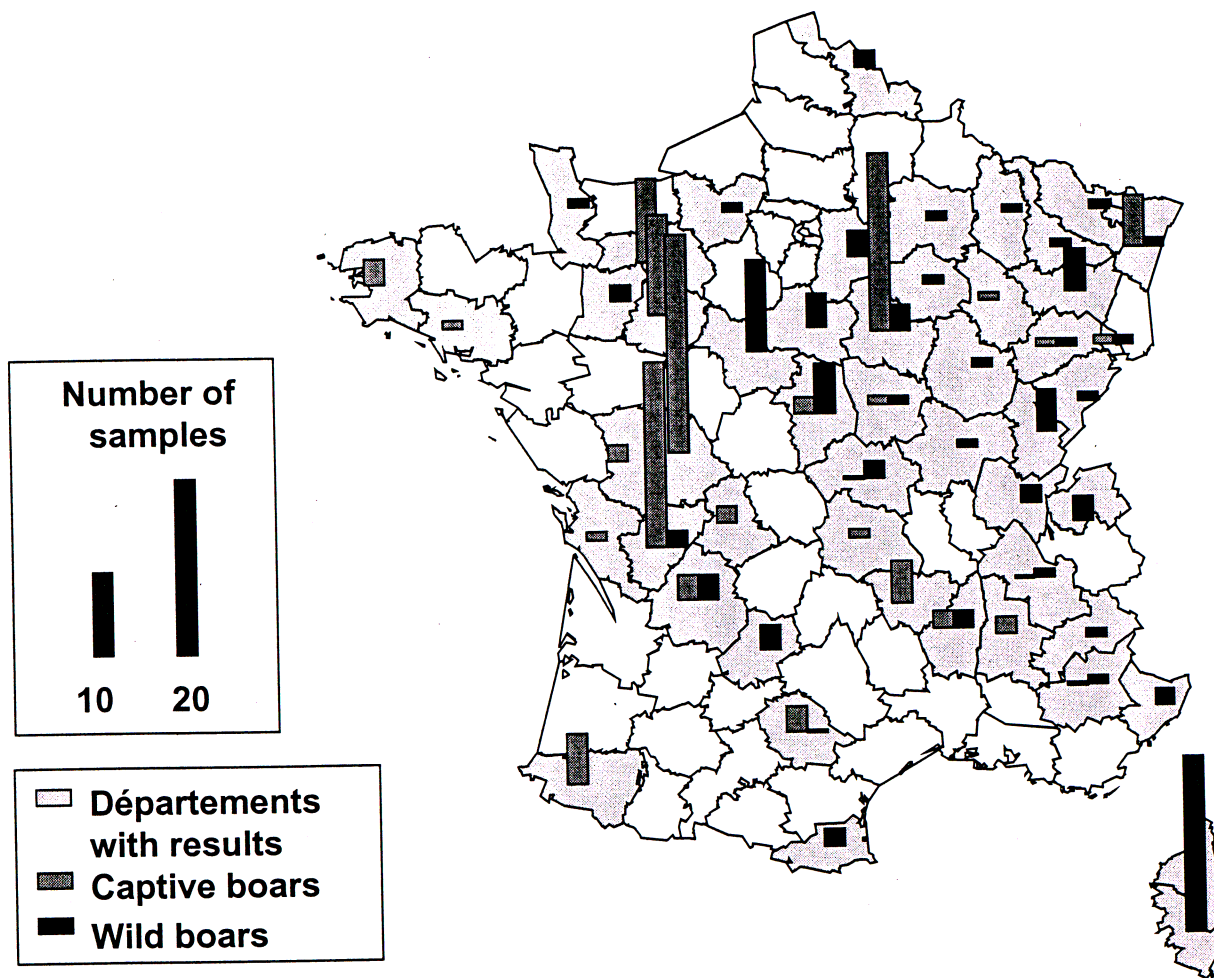


Figure 3: Distribution of wild boars found with serum antibodies against ruminant pestiviruses during the 6-year serological inquiry. The « départements » where anti-ruminant-pestivirus antibodies were detected are in light grey. Bars represent the amount of samples with antibodies collected from captive boars (in light grey) or wild boars (in dark grey).